UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
CHEMICAL SAFETY AND
POLLUTION PREVENTION

MEMORANDUM:

To: Carlyn Petrella

From: Eric Bohnenblust

Date: September 16, 2014

Subject: PRODUCT PERFORMANCE DATA EVALUATION RECORD

This is a secondary review of the efficacy data. Please find the primary review attached.

Task 2-200

Note: Two different DP's were opened and the same study was submitted in both DP's under different MRID #'s .

DP barcode: 417423, 418167
Decision no.: 486766, 487923
Submission no: 944720, 946425
Action code: 570
Product Name: Merus 2.0
EPA Reg. No or File Symbol: 8329-94
Formulation Type: liquid sprayable
Ingredients statement from the label with PC codes included:
Pyrethrin 5.0% PC Code: 069001
Application rate(s) of product and each active ingredient (lbs. or gallons/1000 square feet or per acre as appropriate; and g/m^2 or mg/cm^2 as appropriate): 0.5 - 0.78 oz./acre for undiluted insecticide, or for a 2.5% dilution use 1.00 to 1.56 oz./acre
Use Patterns: Ultra low volume (ULV) outdoor ground and aerial applications for adult mosquitoes

I. Action Requested: Review of data submitted to support efficacy claims for a conditional registration.

II. Background: Review of data submitted to support efficacy claims against Anopheles spp. mosquitoes as the third required species for pyrethrin (Merus 2.0) insecticide.

III. MRID Summary: (attach the primary review)

49301702/49270702: Ground ULV Bioassay against Caged Adult Female *Anopheles quadrimaculatus* Mosquitoes using Merus 2.0™ at 0.50 fl. oz/acre.

(1) This study is GLP compliant.

(2) The purpose of this study was to determine the efficacy of pyrethrin (Merus 2.0) against *Anopheles* spp. mosquitoes. *Anopheles quadrimaculatus* females reared from pupae in the lab were placed in cages and then into open fields in Lake Wales FL. Cages were placed on 5 ft poles which were located 100, 200, and 300 ft downwind and 100 ft apart and perpendicular from the spray line. Mosquitoes exposed for 10 min and then transferred to clean

containers and were monitored for knockdown at 1 h and mortality at 24 h. Insecticide was applied using a ground ULV application. Knockdown at 1 h post application was 90% or higher at 100 and 200 ft from the spray line and 88% at 300 feet. At 24 h post application mortality was 96-97% at 100 and 300 ft from the spray line, and 93% at 200 ft.

(3) Pyrethrin is effective for quick knockdown and adulticidal applications against *Anopheles* spp. mosquitoes.

(4) **Conclusion: Acceptable.** This study in conjunction with previously accepted studies supports adulticial and quick knockdown claims against mosquitoes.

IV. RECOMMENDATIONS:

(1)This study in conjunction with previously approved studies supports a general mosquito claim, and also supports adult mosquito claims, and quick knockdown claims.

TASK 2 DATA EVALUATION RECORD

STUDY TYPE: Product Performance

MRID 493017-02. Jimenez, N. Ground ULV Bioassay against Caged Adult Female *Anopheles quadrimaculatus* Mosquitoes using Merus 2.0™ at 0.50 fl. oz/acre. November 14, 2013.

810.3400: Mosquito, Black fly, and Biting Midge (Sand Fly) Treatments

Product Name: MERUS 2.0
EPA Reg. No. or File Symbol: 8329-94
Decision number: 487923
DP number: 418167

Prepared for
Registration Division (7505)
Office of Pesticide Programs
U.S. Environmental Protection Agency
Washington, DC 20460

Prepared by
Summitec Corporation
Task Order No.: 2-200

Primary Reviewer:
Robert H. Ross, M.S.

Signature: Robert H. Ross RR
Date: 04/22/2014

Secondary Reviewers:
Gene Burgess, Ph.D.

Signature: Gene Burgess GB
Date: 04/22/2014

Robert H. Ross, M.S. Program Manager

Signature: Robert H Ross RR
Date: 04/22/2014

Quality Assurance:
Angela M. Edmonds, B.S.

Signature: Angela M. Edmonds
Date: 04/22/2014

Disclaimer

This review may have been altered subsequent to the contractors' signatures above.

DATA EVALUATION RECORD

[EPA Primary Reviewer's Name]

STUDY TYPE:	810.3400: Mosquito, Black fly, and Biting Midge (Sand Fly) Treatments
MRID:	493017-02/492707-02. Jimenez, N. Ground ULV Bioassay against Caged Adult Female *Anopheles quadrimaculatus* Mosquitoes using Merus 2.0™ at 0.50 fl. oz/acre. November 14, 2013.
DP BARCODE:	418167
DECISION NO:	487923
SUBMISSION NO:	946425
SPONSOR:	Jonathan Ostrowski Clarke Mosquito Control Products, Inc. 110 East Irving Park Road Roselle, Illinois 60172 USA
TESTING FACILITY:	Clark Technical Center 1501 Wright Blvd. Schaumburg, IL 60193
STUDY DIRECTOR:	Nancy Jimenez
SUBMITTER:	Jonathan Ostrowski Clarke Mosquito Control Products, Inc. 110 East Irving Park Road Roselle, Illinois 60172 USA
STUDY COMPLETED:	14/11/2013
CONFIDENTIALITY CLAIMS:	None

GOOD LABORATORY PRACTICE:	This study was conducted in compliance with the Good Laboratory Practice Standards, 40 CFR Part 160, Federal Register Notice Vol. 54 No. 158; effective October 16,1989 with the following exception: Due to calibration configuration issues with the weather instruments, the weather data was not recorded as GLP compliant.
TEST MATERIAL:	PRODUCT NAME: MERUS 2.0 EPA REGISTRATION NUMBER OR FILE SYMBOL: 8329-94 ACTIVE INGREDIENT NAME: Pyrethrins CHEMICAL NAME: Not given A.I. %: 5.0% PC CODE: 069001 CAS NO.: Not given FORMULATION TYPE: Spray PRODUCT APPLICATION RATE(S) g/m^2: 0.5 to 2.5 fl.oz/acre (3.66 to 18.3 mg/m^2, reviewer calculated) ACTIVE INGREDIENT APPLICATION RATE(S)g/m^2: 0.0016 to 0.008 lb/acre (0.18 to 0.9 mg/m^2, reviewer calculated)
PROPOSED LABEL MARKETING CLAIMS:	Mosquito adulticide; quick knockdown

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STUDY REVIEW

Purpose: The objective of this study is to determine the efficacy of Merus 2.0™ against caged adult female *Anopheles quadrimaculatus* mosquitoes.

MATERIALS AND METHODS

Test Location: Lake Wells Florida

Test Material(s): 5.03% pyrethrins which is essentially equivalent to the labeled material and likely within certified limits

Test Species Name, Life Stage, Sex and Age: Adult female *Anopheles quadrimaculatus* mosquitoes

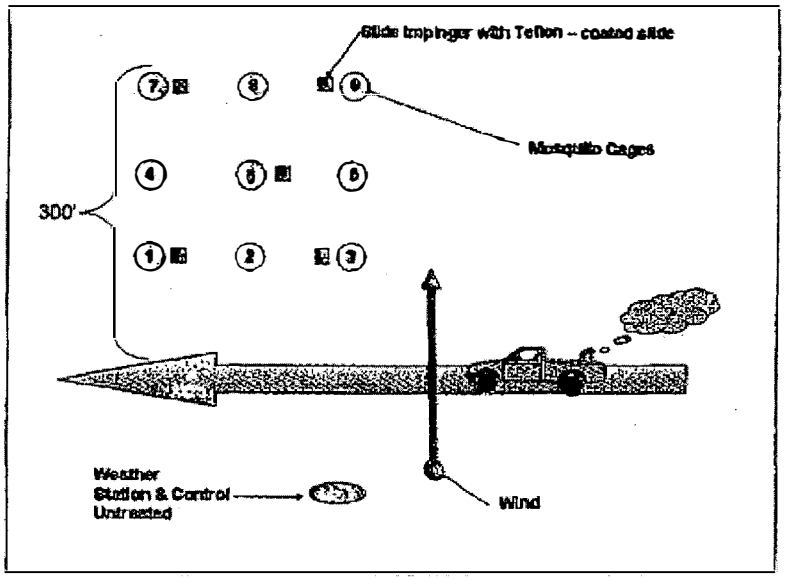
Describe test containers, chambers and/or apparatus (include site description and location) and how experiment was conducted:

Female mosquitoes were mouth aspirated using aspirators with Hepa filters into standard cylindrical cardboard spray cages (14.4cm diameter). (Townzen, K.R. et al. 1973) Mosquito cages were then placed in sealed containers and transported to the field site at Lake Wales, Florida for the trial.

This study consisted of an open field caged trial at an application rate of 0.50 fl. oz. Merus 2.0/acre. *Anopheles quadrimaculatus* mosquitoes were used in this trial. All mosquitoes were visually inspected for accuracy of age and species identification.

The field site consisted of approximately 10 acres of open grassy fields within the Lake Wales Municipal Airport, Lake Wales, and Florida. Spray cages were placed on stakes five (5) feet in height. Stakes were placed at 100, 200 and 300 feet down-wind and 100 feet apart at a 90° angle from the spray line (Figure 1). A total of 10 spray cages containing *Anopheles quadrimaculatus* (9 treated and 1 untreated control) were used in each replicate. Three (3) replications in time were conducted for this trial. After each replicate, the treated mosquitoes were allowed 10 minutes exposure then transferred to clean holding cages for knockdown and mortality monitoring. Mosquitoes were fed a 10% sugar water solution and monitored at 1 hour for knockdown and 24 hours for mortality. Mosquitoes were considered knocked down or dead if they remained moribund after receiving a slight puff of air from the observer. Any movement by a mosquito outside of this observation required the observer to record the individual as alive. Summary data are reported in Table 2.

Figure 1. Spray Site Diagram / Station Locations



Merus 2.0™ was applied using standard ground ULV equipment commonly used for adult mosquito control, Clarke Cougar aerosol generator equipped with a 10 HP Briggs & Stratton IC engine coupled to a 105-CFM ROOTS rotary positive displacement blower. All equipment was calibrated to deliver 0.50 oz. undiluted Merus 2.0 per acre. Air pressure was adjusted to deliver a spray droplet VMD below 20 microns. See Table 1 for specific calibration and spray characterization information.

Table 1. Calibration and Characterization of Spray Equipment at 0.50 oz/acre

Location & Date	Lake Wales, Florida August 22, 2013
Equipment	Cougar (10hp) IHPLAT Nozzle, Smart Flow II System
Dosage	0.50 oz/acre
Flow Rate: (oz/min) (ml spray / minute)	3.03 oz/min (89.62 ml/min)
Final Spray Volume	89.34 ml/min
Swath (ft)	300 ft
Vehicle Speed	10 mph
Droplet Size (µm) Slide Wave Characterization	14.6
Nozzle Angle (Angle of air flow from vertical)	90°

List the treatments including untreated control (express application rate as g/m^2): 0.50 oz/acre; this is equivalent to 3.66 mg/m^2 of product and 0.18 mg/m^2 A.I.; untreated control

Number of replicates per treatment: 3 with 9 cages per replicate

Number of individuals per replicate: 18-25

Length of exposure to treatment (time in seconds, minutes or hours): 10 minutes

Were tested specimens transferred to clean containers? Yes

Experimental conditions (state relative humidity, temperature, and photoperiod):
Meteorological conditions during the trial were recorded with temperatures between 76.3°F and 76.7°F with winds between 1.8 and 2.1 mph at the 5' weather station.

Data or endpoints collected/recorded: 1 hour knockdown and 24 hour mortality

Data analysis: Mean values – Tukey's range test

RESULTS

Table 2. *An. quadrimaculatus* Summary for Merus 2.0™ at 0.50 oz/acre for each distance

An. quadrimaculatus	1- Hour Knockdown	24- Hour Mortality
Distance	Mean % Knockdown[1] (SE)	Mean % Mortality[1] (SE)
100 ft	95.8 (2.80) a	96.4 (1.37) a
200 ft	90.1 (3.71) a	93.6 (1.63) a
300 ft	88.1 (4.23) a	96.9 (1.48) a
Untreated (Control)	0 (0) b	0 (0) b

[1] Means followed by the same letter are not significantly different (P<0.005); mean separation by Tukey's Range Test (α = 0.05), within each challenge set.

Calibration data were presented

Study Author's Conclusions

Merus 2.0 was found to be efficacious at an application rate of 0.50 fl. oz. undiluted per acre under the field conditions reported in this report.

Reviewer's Conclusions

One hour mortality data were considered acceptable even though mortality at 200 ft was < 95% because mortality at 300 ft was > 95%. Knockdown was only acceptable at 100 ft and only if 1 hour is considered quick knockdown as per label claim.

Reviewer's Recommendations

The study supports the label, general mosquito adulticide and quick knockdown claims and supports adding *Anopheles quadrimaculatus* mosquitoes to the label. Note in future reviews we will require meter readings to confirm the amount of insecticide applied.